Technical manual

MA. 937A & B
DC Power Unit and Audio Amplifier

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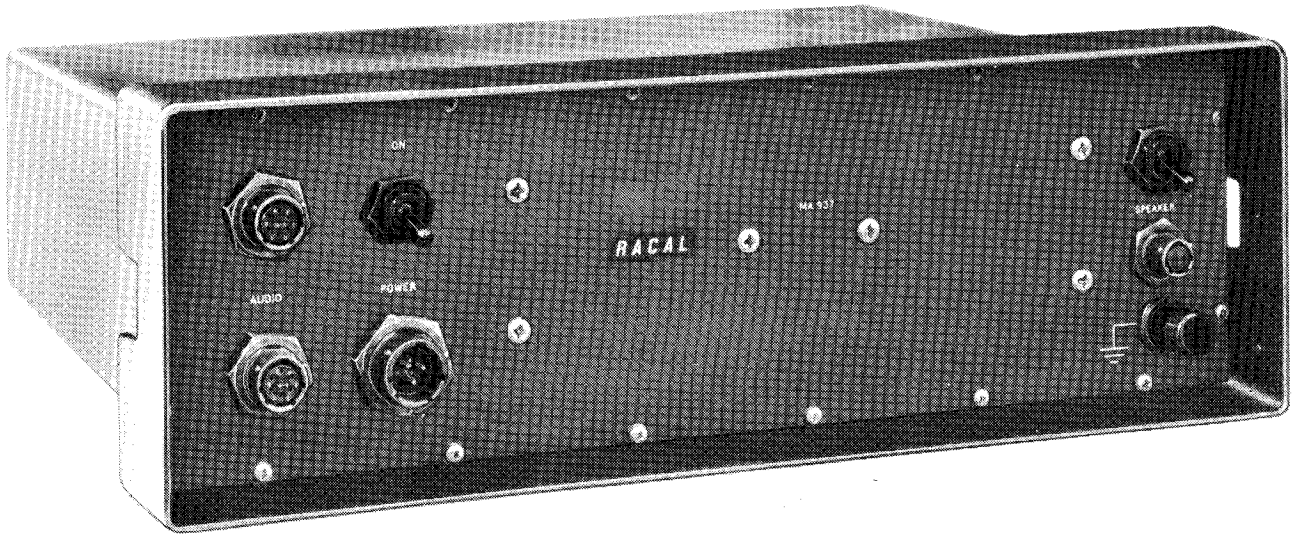

DC Power Unit & Audio Amplifier
MA.937

THIS HANDBOOK REFERS TO EQUIPMENT

SERIAL NUMBER ..... AND SUBSEQUENT

HANDBOOK AMENDMENTS

See Yellow Amendment Sheet Number .....
which follow this page. The action called for by the amendments should be carried out by hand as soon as possible.

DC POWER UNIT AND AUDIO AMPLIFIER

TYPE MA. 937

VARIANTS

The MA.937A Version is a DC Power Supply and Audio Amplifier, and all information in this handbook is applicable to this version.

The MA.937B does not incorporate an audio amplifier, therefore the SPEAKER ON/OFF switch and the SPEAKER output socket are removed from the front panel, and any references to the audio amplifier should be ignored.

D.C. POWER UNIT AND AUDIO AMPLIFIER

TYPE MA.937

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D.C. POWER UNIT AND AUDIO AMPLIFIER

TYPE MA.937

INTRODUCTION

1. The D.C. Power Unit and Audio Amplifier type MA.937 operates from a d.c. supply in the range 10-32 volts. The power unit provides a regulated d.c. output of either 18 volts or 24 volts for the 900 Series range of Manpacks. The audio amplifier provides amplification for the Manpack audio output and delivers an output of 1.0 watt into an external 8 ohm loudspeaker.

CONSTRUCTION

2. The MA.937 is housed in a high-impact splashproof plastic case. To prevent the emission of radio frequency interference, all switching circuits are enclosed in a screened metal container with feed-through capacitors for input and output connections. The front panel of the unit is completely isolated from the d.c. supply.

3. The front panel carries all the controls and connectors as follows:-

(1) POWER ON/OFF switch.

(2) SPEAKER ON/OFF switch.

(3) SPEAKER output socket.

(4) Two six-way AUDIO sockets.

(5) One three-way POWER input connector.

(6) Earth terminal.

ELECTRICAL CHARACTERISTICS

4.

D.C. Input:	12.5V to 32V, 12A maximum.
D.C. Output:	18V nominal 3.8A maximum or 24V nominal 3.8A maximum
Full load/no load ratio at 25°C	1:1

NOTE: The MA.937 will operate a Manpack at reduced output power from a d.c. input of 10V.

Audio Amplifier Output:	1.0W with less than 5% distortion.
Audio Amplifier Sensitivity:	550mV (1mW into 300 ohms) for 1.0W output.

15. One output of the 8kHz multivibrator, 1TR1 and 1TR2, is applied to a divide-by-two circuit, 1IC1, whose two outputs are connected to two inputs of the gating circuit, 1IC2. The second output of the multivibrator is fed, via an integrating circuit, 1R20 and 1C6, to the base of 1TR10 to produce a triangular waveform at the input to the Mark/Space Generator, 1TR11 and 1TR12.

16. The mark/space ratio of the Mark/Space Generator is controlled by the signal applied to the base of 1TR12. The output of the Mark/Space Generator is applied to the other two inputs of the gating circuit, 1IC2.

17. The gating circuit alternately routes the variable mark/space pulses to the bases of the push-pull driver stage, 1TR5 and 1TR6. The control of 1IC2 is effected by the complementary outputs of the divide-by-two stage, 1IC1.

18. The push-pull driver stage operates with both transistors in the 'normally on' state. The variable mark/space pulses alternately switch off 1TR5 and 1TR6 to produce the drive waveform across driver transformer, 1T1. The power transistors, TR1 and TR2, are thus driven from a low impedance source when they are switched off ensuring fast switching and symmetrical operation of the inverter.

19. Transistors 1TR3 and 1TR4 provide a constant current source for the driver stage.

Voltage Reference and Detector

20. The Voltage Reference and Detector circuit, 1D7 and 1TR18, is connected across the output of the Power Supply. The output of 1TR18, which is proportional to the error signal, is applied to the Isolated Coupler, 1IL1, and fed to the base of 1TR14. Resistors 1R40 and 1R43 set the levels for 18 volts and 24 volts output respectively.

21. Upon switching on the input supply, the voltage at the base of 1TR18 rises until it conducts. This causes a current to flow through 1IL1 which applies an increasing voltage to the base of 1TR14. The increasing voltage thus applied to the base of 1TR12 tends to reduce the mark/space ratio of the Mark/Space Generator to a point where the output voltage is maintained at the required level. Resistor 1R35 standardises the gain of the Isolated Coupler.

Current Detector

22. The voltage across resistors 2R1, 2R2 and 2R3, which is proportional to the current in transistors TR1 and TR2, is compared with the voltage set by 1R33. If this voltage is exceeded, 1TR13 tends to cut-off causing its collector, and hence the emitter of 1TR16, to go positive. This also causes the emitter of 1TR15 to go positive and apply a positive-going signal to the base of 1TR12, thereby reducing the mark/space ratio of the Mark/Space Generator. Resistors 1R27, 1R29 and capacitor 1C8 form a stabilizing network.

Switch-on Detector

23. Transistor 1TR7 detects that the input supply voltage is greater than 9 volts, and 1TR8 detects that the stabilised 5 volts line, provided by 1TR9 and 1D4, is established. If either condition is not satisfied 1TR7 will switch-off thus applying the input supply voltage, via 1R17 and 1D5, to the base of 1TR14. When this happens 1TR14 will switch on and apply a positive voltage to the base of 1TR12 which will inhibit the output of the Mark/Space Generator.

Protection

24. In the event of a continuous short circuit occurring across the output at high ambient temperatures, the thermostat (X1), which is mounted on the power transistors heat sink, will operate and cut off the supply to the driver transformer 1T1.

25. Choke L1 in the input supply circuit provides surge suppression and diode D3 protects the unit against reversed polarity of the input supply.

Fig.8

Audio Amplifier

26. The audio signal at pin F of audio sockets SKA and SKB is applied, via pin D5 of the Audio Amplifier board, to the two-stage voltage amplifier 4TR1, 4TR2. The output from 4TR2 feeds the driver stages 4TR5, 4TR6. Transistors 4TR5 and 4TR6 function as a complementary pair, to provide push-pull audio drive to the bases of the output transistors 4TR7 and 4TR8. The audio output appearing between pins D2 and D1 is fed to socket SKC via switch SB. Negative feedback is applied from the output stage via 4R6 and 4R5 to 4TR1 emitter. Diodes 4D1 and 4D2 provide d.c. bias and thermal stabilisation.

27. Transistors 4TR3 and 4TR4 provide overload protection for the output transistors. For normal operating conditions, 4TR3 and 4TR4 are non-conducting. Should the amplifier be over-driven, the voltage developed across 4R13 and 4R12 will be sufficient to cause 4TR3 and 4TR4 to conduct. This will limit the base drive available to 4TR6 and 4TR5, and hence limit the maximum output current delivered by 4TR7 and 4TR8.

28. During transmission, closure of the PTT circuit applies an earth connection via pin D4 to the junction of 4R15 and 4R16. This action mutes the Audio Amplifier preventing acoustic feedback to the transmit audio path.

DISMANTLING AND REASSEMBLY

29. The following procedure should be adopted:

(1) Remove the 16 Pozidrive screws securing the cover to the front panel of the unit and remove the cover.

(2) Remove the 14 screws securing the top cover to the screened metal container.

(3) To reassemble the MA.937 reverse the procedure for dismantling.

TEST PROCEDURE

D.C. Power Supply Tests (24V)

31. (1) Connect the rheostat, in series with a multimeter (set to the 10A d.c. range), between pin B and pin D of one of the 6 way audio sockets on the MA.937.

(2) Connect the second multimeter (set to the 25V d.c. range) between pin B and pin D of the 6 way audio socket (positive lead to pin B).

(3) Connect the d.c. power supply to the 3 way POWER input connector (positive to pin A, negative to pin B).

(4) Set the rheostat to maximum resistance (168 ohms) and the output of the d.c. power supply to zero. Set the MA.937 POWER switch to ON.

(5) Increase the output of the d.c. power supply to 32V.

(6) Adjust 1R43 on the Regulator Board for 24.5 volts output from the MA.937.

NOTE: Should this output voltage not be attainable, adjust 1R33 on the Regulator board slightly counter-clockwise.

(7) Adjust the rheostat for an output current of 4.5A and adjust 1R33 clockwise until the output voltage falls rapidly.

(8) Connect a shorting link across the rheostat and ensure that (a) the output current does not exceed 5.5A, and (b) the input current does not exceed 2A. Remove the shorting link.

(9) Adjust the rheostat for an output current of 3.8A.

(10) With the input voltage from the d.c. power supply at 32V ensure that the input current does not exceed 4.9A.

(11) Connect the oscilloscope probe to pin B of the 6-way audio socket, and the earth lead to pin D. Ensure that the peak-to-peak ripple voltage does not exceed 100mV.

(12) Decrease the input voltage from the d.c. power supply to 12.5V and ensure that (a) the input current does not exceed 12A, and (b) the output voltage is within the limits 24V and 24.5V.

(13) Decrease the input voltage until the output voltage collapses. Ensure that the input voltage is within the limits 7V and 9V.

(13) Switch off the d.c. power supply and set the MA.937 POWER switch to OFF. Disconnect the rheostat, oscilloscope and multimeters but leave the d.c. power supply connected.

Audio Amplifier Tests

33. (1) Connect the line inputs of the oscilloscope and the A.F. power meter to pin A of SKC, and connect the ground terminals to pin B of SKC.

(2) Connect the A.F. signal generator and the A.F. valve voltmeter between pins F (line) and D (earth) of a 6-pin ~~Pygmy~~ plug and connect it to one of the AUDIO sockets on the MA.937.

(3) Set the frequency of the signal generator to 1kHz and the output level to zero.

(4) Set the POWER switch to ON and the SPEAKER switch to ON.

(5) Increase the output level from the signal generator until the power meter indicates 1.0 Watt. Ensure that the output waveform displayed on the oscilloscope is sinusoidal.

(6) Decrease the output level from the signal generator until the power meter indicates 0.5 Watt. Ensure that input level indicated on the valve voltmeter is not greater than 385mV. Note the actual level.

(7) Set the frequency of the signal generator to 200Hz maintaining the same input level as noted in (6). Ensure that the output level indicated on the power meter is within the limits 100mW and 300mW.

(8) Set the frequency of the signal generator to 5kHz maintaining the same input level as noted in (6). Ensure that the output level indicated on the power meter is within the limits 400mW and 600mW.

(9) Set the POWER switch to OFF and disconnect the test equipment from the AUDIO socket.

Overall Check of Equipment

34. (1) Connect the MA.937 to the power supply, manpack and audio equipment in the normal manner. Connect an 8 ohm loudspeaker to the output socket SKTC.

(2) Switch on the equipment and check for correct operation.

See new lists.

LIST OF COMPONENTS

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number
		CHASSIS AND FRONT PANEL			
Resistors					
	Ohms				
R1	56	Metal Oxide		2	908142
* R2		Preset Variable, Resistance Wire 16 s.w.g. (80 mm.)			923249
Capacitors					
	F		Volts		
C1	0.1μ	Filter Feed Thro'	50		924977
C2	2350 + 2350μ	Electrolytic	63	+50 -10	919116
C3	2200p	Ceramic	500	20	902126
C4	0.22μ	Polyester	100	20	909882
C5	2200μ	Electrolytic	40	+50 -10	922382
C6	0.1μ	Filter Feed Thro'	50		924977
C7	0.1μ	Filter Feed Thro'	50		924977
C8	47μ	Fixed		+50 -10	921527
C9	1000p	Ceramic	500	10	918423
Inductors					
L1	0.5mH				921341
L2	2mH				921340
Transformer					
T1					CT 710230
Transistors					
TR1		2N5039			921339
TR2		2N5039			921339
Diodes					
D1		3SF1			921356
D2		3SF1			921356
D3		16FR 20			923221
Switches					
SA		Single-pole two-way			917792
SB		Two-pole two-way			900265
X1		Thermostat			711089

* Value adjusted on test

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number
Resistors (Cont'd)					
	Ohms		Watts		
1R16	10k	Carbon Film	1/3	10	918073
1R17	10k	Carbon Film	1/3	10	918073
1R18	1.8k	Carbon Film	1/3	10	919177
1R19	4.7k	Carbon Film	1/3	10	919165
1R20	10k	Carbon Film	1/3	10	918073
1R21	4.7k	Carbon Film	1/3	10	919165
1R22	4.7k	Carbon Film	1/3	10	919165
1R23	2.2k	Carbon Film	1/3	10	919169
1R24	4.7k	Carbon Film	1/3	10	919165
1R25	4.7k	Carbon Film	1/3	10	919165
1R26	100	Carbon Film	1/3	10	918076
1R27	1.5k	Carbon Film	1/3	10	919180
1R28	1.8k	Carbon Film	1/3	10	919169
1R29	100k	Carbon Film	1/3	10	919163
1R30	Not used				
1R31	1k	Carbon Film	1/3	10	918075
1R32	2.7k	Carbon Film	1/3	10	919170
1R33	1k	Variable			920315
*1R34	47k	Carbon Film	1/3	10	919188
1R35	10k	Variable			920313
1R36	1k	Carbon Film	1/3	10	918075
1R37	2.7k	Carbon Film	1/3	10	919170
1R38	1k	Carbon Film	1/3	10	918075
1R39	1.2k	Metal Oxide		2	906550
1R40	470	Variable			920610
1R41	2.2k	Metal Oxide		2	910984
1R42	680	Metal Oxide		2	919321
1R43	470	Variable			920610
1R44	3.3k	Composition	1/10	10	902514
1R45	100	Carbon Film	1/3	10	918076
1R46	220	Carbon Film	1/3	10	919174

* The value of 1R34 is selected at test and may be in the range 4.7k to 47k.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number
Diodes					
1D1		S2F			921357
1D2		S2F			921357
1D3		BZY88-C6V2			911682
1D4		BZY88-C4V7			914067
1D5		1N4149			914898
1D6		1N4149			914898
1D7		BZY88-C6V2			911682
1D8		BZY88-C5V6			921141
Integrated Circuits					
1IC1		JK Flip-Flop 74L72N			920687
1IC2		Dual 4 input Nand gate 7420N			913523
Isolated Coupler					
1IL1					921343
Sockets					
18V		Black			919302
24V		Red			916885

RECTIFIER BOARD

	Ohms		Watts		
Resistors					
2R1	0.1	Wirewound	2½	10	921359
2R2	0.1	Wirewound	2½	10	921359
2R3	0.1	Wirewound	2½	10	921359
Diodes					
2D1		3SF1			921356
2D2		3SF1			921356

AUDIO AMPLIFIER

	Ohms		Watts		
Resistors					
4R1	56	Carbon Film	1/3	10	919185
4R2	5.6k	Carbon Film	1/3	10	919181
4R3	2.2k	Carbon Film	1/3	10	919169
4R4	6.8k	Carbon Film	1/3	10	919192
4R5	220	Carbon Film	1/3	10	919174

Cat. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number
Resistors (Cont'd)					
	Ohms		Watts		
4R6	1.5k	Carbon Film	1/3	10	919180
4R7	6.8k	Carbon Film	1/3	10	919192
4R8	68	Carbon Film	1/3	10	919186
4R9	1k	Carbon Film	1/3	10	918075
4R10	1k	Carbon Film	1/3	10	918075
4R11	1k	Carbon Film	1/3	10	918075
4R12	0.82	Wirewound	2½	5	922737
4R13	0.82	Wirewound	2½	5	922737
4R14	Not used				
4R15	1k	Carbon Film	1/3	10	918075
4R16	1k	Carbon Film	1/3	10	918075
4R17	1k	Carbon Film	1/3	10	918075
Capacitors					
	F		Volts		
4C1	.01μ	Disc Ceramic	250	-20 +40	916187
4C2	4.7μ	Tantalum	35	20	914026
4C3	0.47μ	Tantalum	35	20	915168
4C4	.01μ	Disc Ceramic	250	-20 +40	916187
4C5	4.7μ	Tantalum	35	20	914026
4C6	.01μ	Ceramic	63	20	915173
4C7	4.7μ	Tantalum	35	20	915168
4C8	Not used				
4C9	680μ	Electrolytic		-10 +50	919118
Diodes					
4D1		1N4149			914898
4D2		1N4149			914898
4D3		1N4149			914898
Transistors					
4TR1		ZTX212			923172
4TR2		ZTX237			923171
4TR3		ZTX237			923171
4TR4		ZTX212			923172
4TR5		ZTX212			923172
4TR6		ZTX237			923171
4TR7		2N3054			911951
4TR8		2N3054			911951

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number
Capacitors					
	F		Volts		
1C1	1000p	Polystyrene	30	5	906711
1C2	1000p	Polystyrene	30	5	906711
1C3	.047µ	Polyester	100	+50 -25	919640
1C4	.047µ	Polyester	100	+50 -25	919640
1C5	220u	Electrolytic	10		921532
1C6	.047µ	Polyester	100	10	919634
1C7	1000µ	Ceramic	500	10	918423
1C8	0.47µ	Tantalum	35	20	915168
1C9	0.47µ	Tantalum	35	20	915168
1C10	0.47µ	Tantalum	35	20	915168
Transformers					
1T1					CT 710160
Transistors					
1TR1		ZTX237			923171
1TR2		ZTX237			923171
1TR3		ZTX237			923171
1TR4		2N5954			921358
1TR5		BS X61			916632
1TR6		BSX61			916632
1TR7		ZTX237			923171
1TR8		ZTX237			923171
1TR9		BFY51			908753
1TR10		ZTX237			923171
1TR11		ZTX212			923172
1TR12		ZTX212			923172
1TR13		ZTX237			923171
1TR14		ZTX237			923171
1TR15		ZTX237			923171
1TR16		ZTX237			923171
1TR17		ZTX237			923171
1TR18		ZTX212			923172

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number
Plugs					
PL1		Input			916494
L.S.		Amphenol (2 pin)			919750
Sockets					
SKTA		6-way			909908
SKTB		6-way			909908
SKTC		Loudspeaker			915571
Fuses					
FS1 (and spare)			10A		907905
Miscellaneous					
FX1) FX2) FX3)		Ferrite Core Assembly			701496
		Fuseholder (and Spare)			924223
		Earth Terminal			901399

REGULATOR BOARD

	Ohms		Watts		
Resistors					
1R1	4.7k	Carbon Film	1/3	10	919165
1R2	100k	Carbon Film	1/3	10	919163
1R3	100k	Carbon Film	1/3	10	919163
1R4	4.7k	Carbon Film	1/3	10	919165
1R5	330	Carbon Film	1/3	10	919179
1R6	4.7	Wirewound	2½	5	917145
1R7	470	Carbon Film	1/3	10	919187
1R8	100	Carbon Film	1/3	10	918076
1R9	100	Carbon Film	1/3	10	918076
1R10	470	Carbon Film	1/3	10	919187
1R11	10	Carbon Film	1/3	10	919173
1R12	10	Carbon Film	1/3	10	919173
1R13	470	Carbon Film	1/3	10	919187
1R14	4.7k	Carbon Film	1/3	10	919165
1R15	15k	Carbon Film	1/3	10	918078

(13) Switch off the d.c. power supply and set the MA.937 POWER switch to OFF. Disconnect the rheostat, oscilloscope and multimeters but leave the d.c. power supply connected.

Audio Amplifier Tests

33. (1) Connect the line inputs of the oscilloscope and the A.F. power meter to pin A of SKC, and connect the ground terminals to pin B of SKC.

(2) Connect the A.F. signal generator and the A.F. valve voltmeter between pins F (line) and D (earth) of a 6-pin plug and connect it to one of the AUDIO sockets on the MA.937.

(3) Set the frequency of the signal generator to 1kHz and the output level to zero.

(4) Set the POWER switch to ON and the SPEAKER switch to ON.

(5) Increase the output level from the signal generator until the power meter indicates 1.0 Watt. Ensure that the output waveform displayed on the oscilloscope is sinusoidal.

(6) Decrease the output level from the signal generator until the power meter indicates 0.5 Watt. Ensure that input level indicated on the valve voltmeter is not greater than 385mV. Note the actual level.

(7) Set the frequency of the signal generator to 200Hz maintaining the same input level as noted in (6). Ensure that the output level indicated on the power meter is within the limits 100mW and 300mW.

(8) Set the frequency of the signal generator to 5kHz maintaining the same input level as noted in (6). Ensure that the output level indicated on the power meter is within the limits 400mW and 600mW.

(9) Set the POWER switch to OFF and disconnect the test equipment from the AUDIO socket.

Overall Check of Equipment

34. (1) Connect the MA.937 to the power supply, manpack and audio equipment in the normal manner. Connect an 8 ohm loudspeaker to the output socket SKTC.

(2) Switch on the equipment and check for correct operation.

TEST PROCEDURE

D.C. Power Supply Tests (24V)

31. (1) Connect the rheostat, in series with a multimeter (set to the 10A d.c. range), between pin B and pin D of one of the 6 way audio sockets on the MA.937.

(2) Connect the second multimeter (set to the 25V d.c. range) between pin B and pin D of the 6 way audio socket (positive lead to pin B).

(3) Connect the d.c. power supply to the 3 way POWER input connector (positive to pin A, negative to pin B).

(4) Set the rheostat to maximum resistance (168 ohms) and the output of the d.c. power supply to zero. Set the MA.937 POWER switch to ON.

(5) Increase the output of the d.c. power supply to 32V.

(6) Adjust 1R43 on the Regulator Board for 24.5 volts output from the MA.937.

NOTE: Should this output voltage not be attainable, adjust 1R33 on the Regulator board slightly counter-clockwise.

(7) Adjust the rheostat for an output current of 4.5A and adjust 1R33 clockwise until the output voltage falls rapidly.

(8) Connect a shorting link across the rheostat and ensure that (a) the output current does not exceed 5.5A, and (b) the input current does not exceed 2A. Remove the shorting link.

(9) Adjust the rheostat for an output current of 3.8A.

(10) With the input voltage from the d.c. power supply at 32V ensure that the input current does not exceed 4.9A.

(11) Connect the oscilloscope probe to pin B of the 6-way audio socket, and the earth lead to pin D. Ensure that the peak-to-peak ripple voltage does not exceed 100mV.

(12) Decrease the input voltage from the d.c. power supply to 12.5V and ensure that (a) the input current does not exceed 12A, and (b) the output voltage is within the limits 24V and 24.5V.

(13) Decrease the input voltage until the output voltage collapses. Ensure that the input voltage is within the limits 7V and 9V.

EQUIPMENT REQUIRED FOR TESTING

30. (1) D.C. Power Supply

Voltage Range: 0-32V
Current Rating: 10A max.
(Example: VAREX 33/10)

(2) Multimeter (2 off)

(Example: Avo Model 8)

(3) Rheostat

Resistance Range: 0-168 ohm
Current Rating: 5A
(Example: Berco DLSM15 - 0.18A)

(4) AF Signal Generator

Frequency Range: 50Hz to 20kHz
Impedance: 600 ohms
(Example: Advance J2, J2C)

(5) Audio Power Meter

Bandwidth: 20kHz minimum
Power: 1W F.S.D.
Impedance: 8 ohms
(Example: Marconi TF893A)

(6) Loudspeaker

Impedance: 8 ohms

(7) Oscilloscope

(Example: Tektronix 545)

(8) Pigmy Plugs

1 for 6 way socket
(Example: Thorn GB 62GB-56J10-6P)
1 for 3 way socket
(Example: Thorn PTO 6W-12-3S)
1 for 2 way socket
(Example: Thorn GB 626B-5J8-2P)

(9) A.F. Valve Voltmeter

(Example: Advance 77C)

(2) Setting the SPEAKER switch to ON switches the amplified audio output from the Manpack to the SPEAKER output socket. The volume is controlled from the front panel of the manpack. The output of the Audio Amplifier is automatically muted on transmit.

PRINCIPLES OF OPERATION

D.C. Power Supply

Fig.1

8. The input voltage, in the range 10-32V d.c., is applied to two power transistors connected in push-pull. The output of the push-pull stage is transformer coupled to a full wave rectifier and smoothing circuit to provide +18V d.c. or +24V d.c. as required for the Manpack.

9. One output from the 8kHz Multivibrator is taken via a divide-by-two circuit to one input of a gating circuit. The second output from the Multivibrator is integrated and applied to a Mark/Space Generator. The output of the Mark/Space Generator which consists of varying mark/space pulses is applied to the other input of the gating circuit. The gated mark/space pulses are fed alternately to the inputs of the push-pull driver stage which is transformer coupled to the output stage.

10. The output of the Power Supply is the average value of the mark/space waveform from the Mark/Space Generator. Control is effected by the error signal from the Voltage Reference and Detector which monitors the output voltage.

11. Excessive load current is detected by the Current Detector which applies an overriding control signal to the Mark/Space generator to lower the output voltage.

12. The Switch-on Detector also applies a control signal to the Mark/Space Generator, to inhibit the output of the Power Supply, when the input voltage falls below 9 volts.

Audio Amplifier

13. The Audio Amplifier uses a complementary push-pull output stage fed from a two stage amplifier and employs heavy negative feedback. The output of the amplifier is muted by an input connected to the manpack press-to-talk line which prevents acoustic feedback occurring during transmit.

CIRCUIT DESCRIPTION

D.C. Power Supply

Fig.9

14. The push-pull power output stage, TR1 and TR2, is coupled by transformer T1 to 2D1 and 2D2 providing full wave rectification which is averaged and smoothed by filter L2 and C5. Capacitors C4, C6 and C7 provide RF suppression.

D.C. POWER UNIT AND AUDIO AMPLIFIER

TYPE MA.937

INTRODUCTION

1. The D.C. Power Unit and Audio Amplifier type MA.937 operates from a d.c. supply in the range 10-32 volts. The power unit provides a regulated d.c. output of either 18 volts or 24 volts for the 900 Series range of Manpacks. The audio amplifier provides amplification for the Manpack audio output and delivers an output of 1.0 watt into an external 8 ohm loudspeaker.

CONSTRUCTION

2. The MA.937 is housed in a high-impact splashproof plastic case. To prevent the emission of radio frequency interference, all switching circuits are enclosed in a screened metal container with feed-through capacitors for input and output connections. The front panel of the unit is completely isolated from the d.c. supply.

3. The front panel carries all the controls and connectors as follows:-

(1) POWER ON/OFF switch.

(2) SPEAKER ON/OFF switch.

(3) SPEAKER output socket.

(4) Two six-way AUDIO sockets.

(5) One three-way POWER input connector.

(6) Earth terminal.

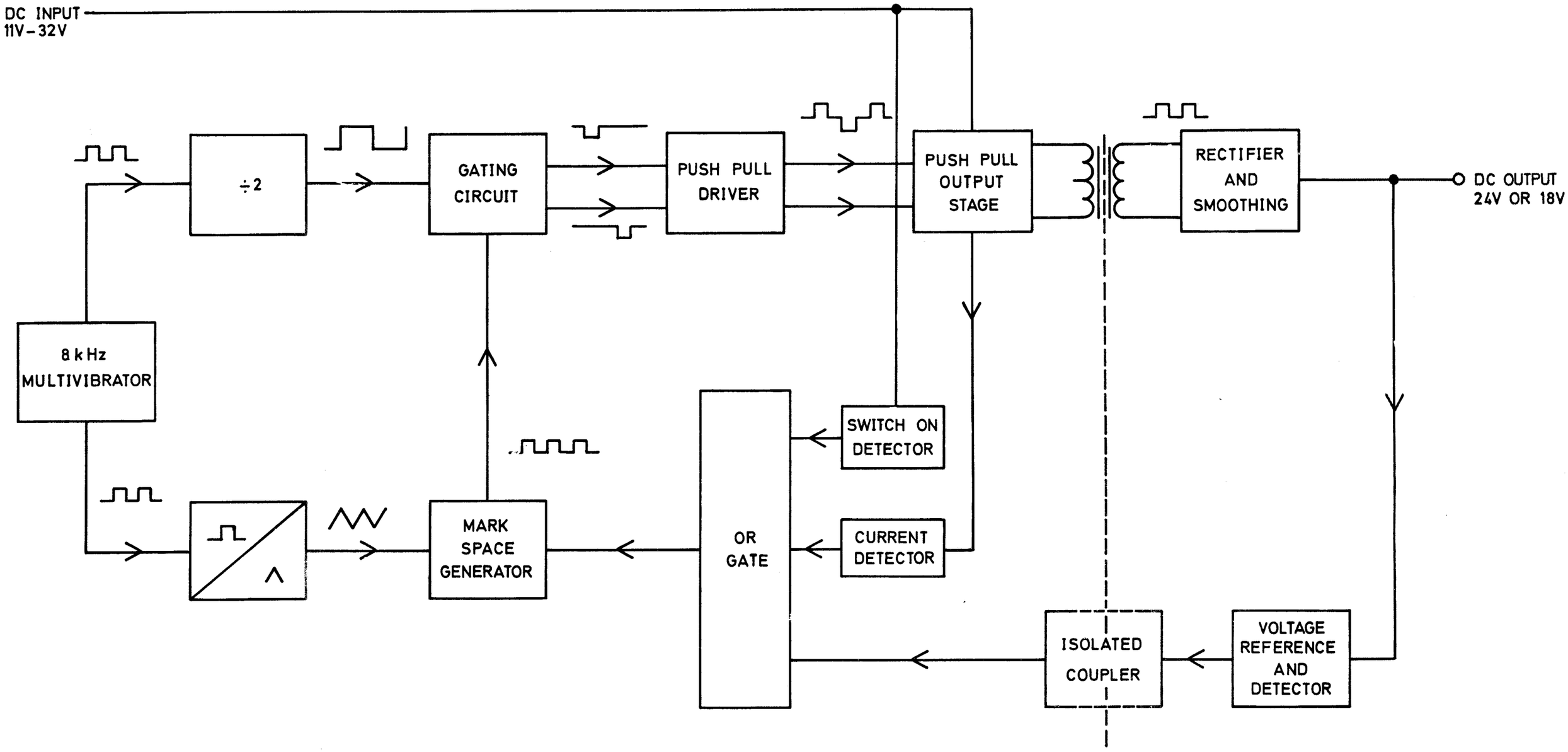
ELECTRICAL CHARACTERISTICS

4.

D.C. Input:	12.5V to 32V, 12A maximum.
D.C. Output:	18V nominal 3.8A maximum or 24V nominal 3.8A maximum
Full load/no load ratio at 25°C	1:1

NOTE: The MA.937 will operate a Manpack at reduced output power from a d.c. input of 10V.

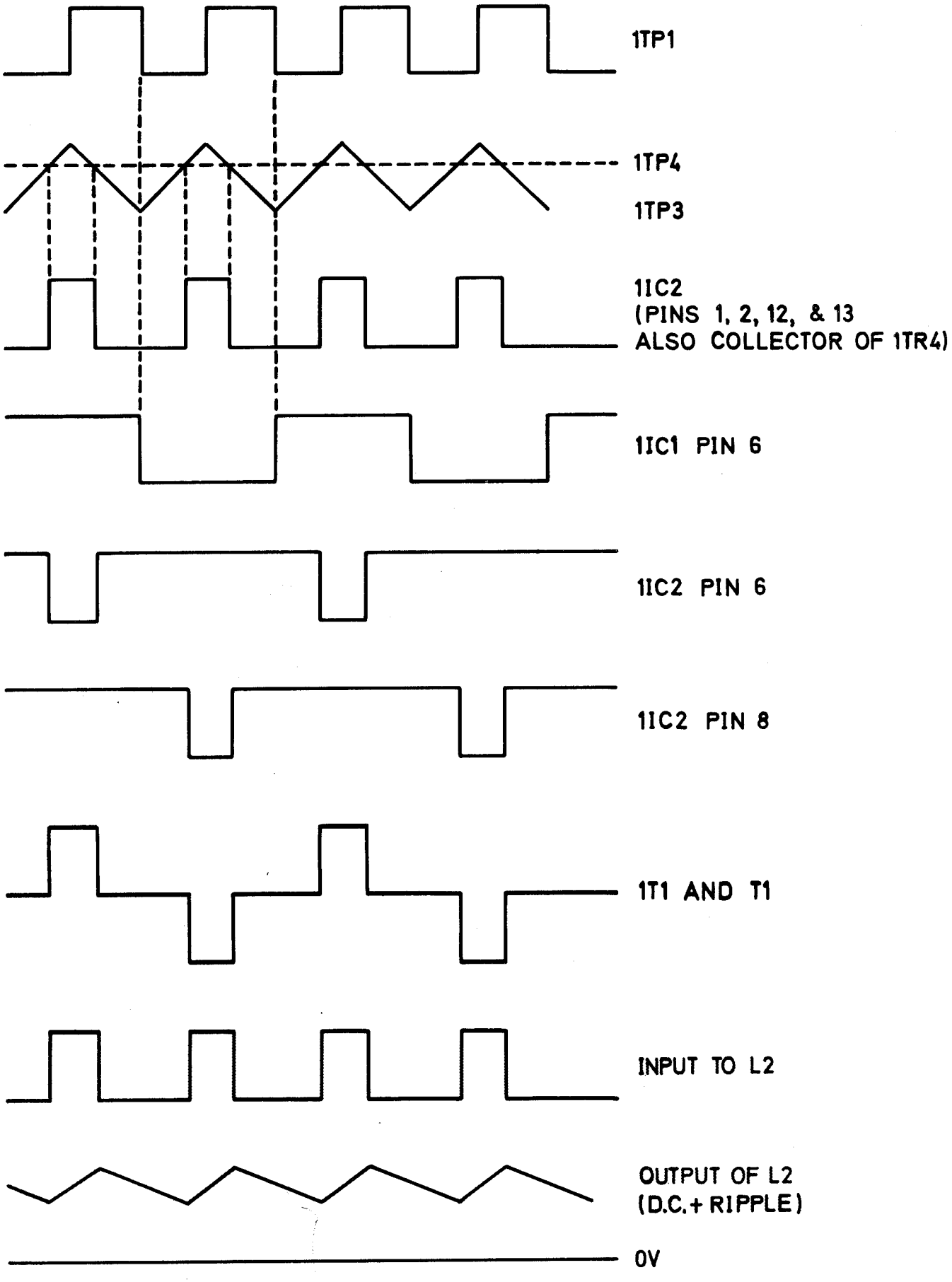
Audio Amplifier Output:	1.0W with less than 5% distortion.
Audio Amplifier Sensitivity:	550mV (1mW into 300 ohms) for 1.0W output.



WOH3059

Block Diagram : MA937

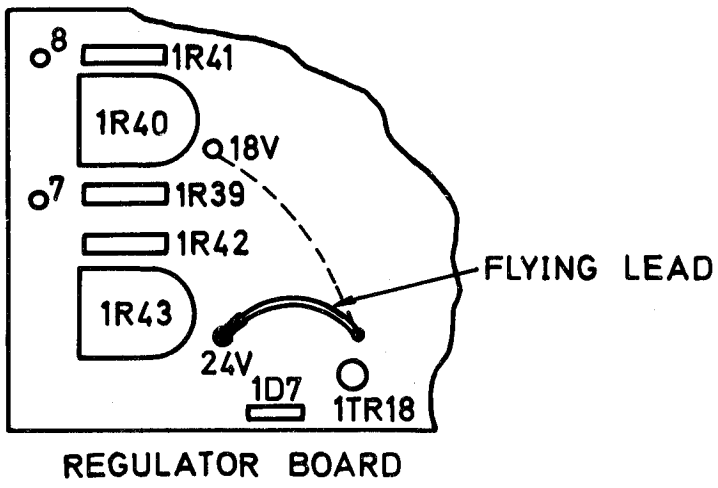
Fig. 1



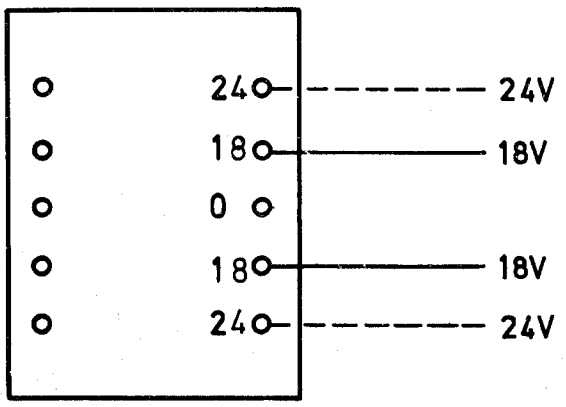
WOH3059

Waveforms: MA.937

Fig. 2



POSITION OF FLYING LEAD ON REGULATOR BOARD FOR 18V AND 24V WORKING

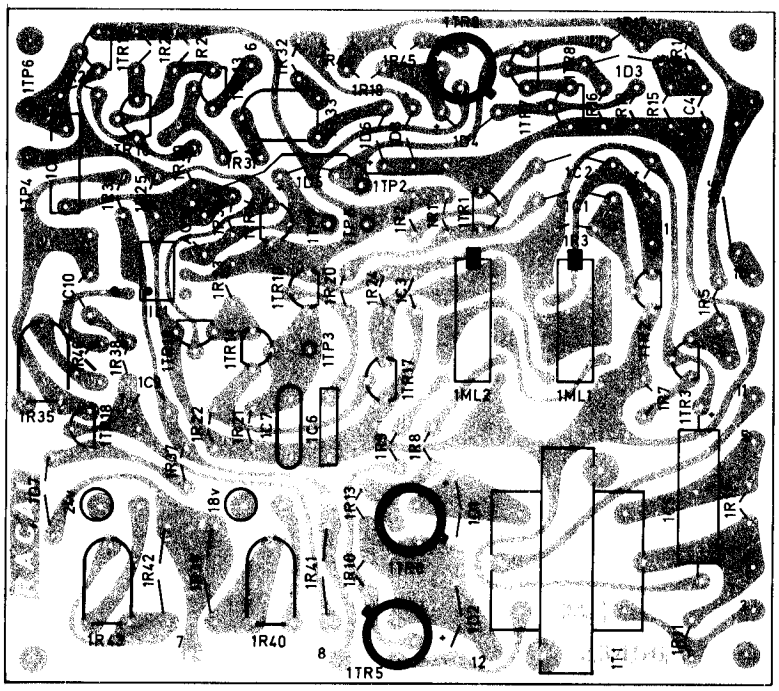


OUTPUT TRANSFORMER T1
18V AND 24V CONNECTION

WOH3059

Connections for 18V and 24V Working
MA.937

Fig. 3

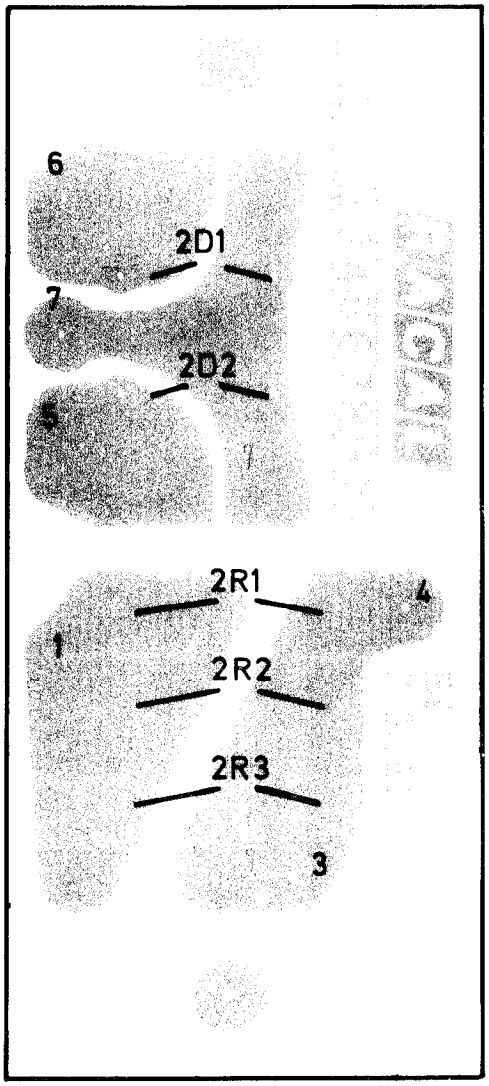


WOH 3059

WOH 3059

Component Layout: Regulator Board

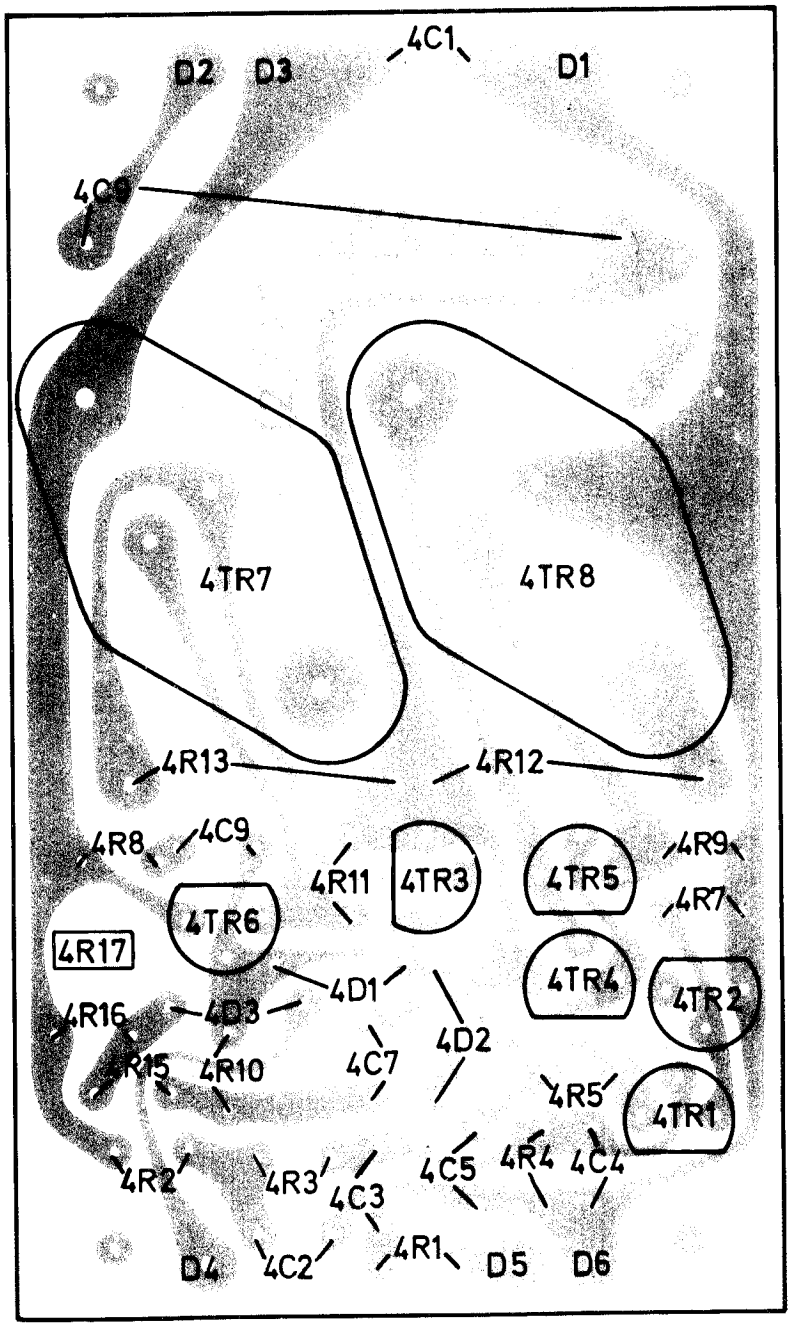
Fig. 4



WOH3059

Component Layout
Rectifier Board

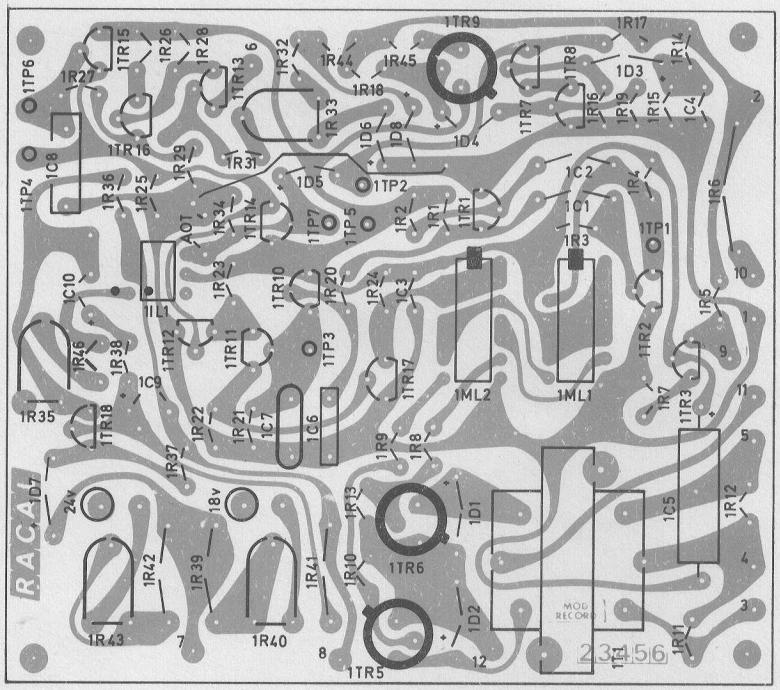
Fig. 5



WOH3059	CD713034 SHT.3
3 4	

Component Layout:
Amplifier P.C.B

Fig. 6

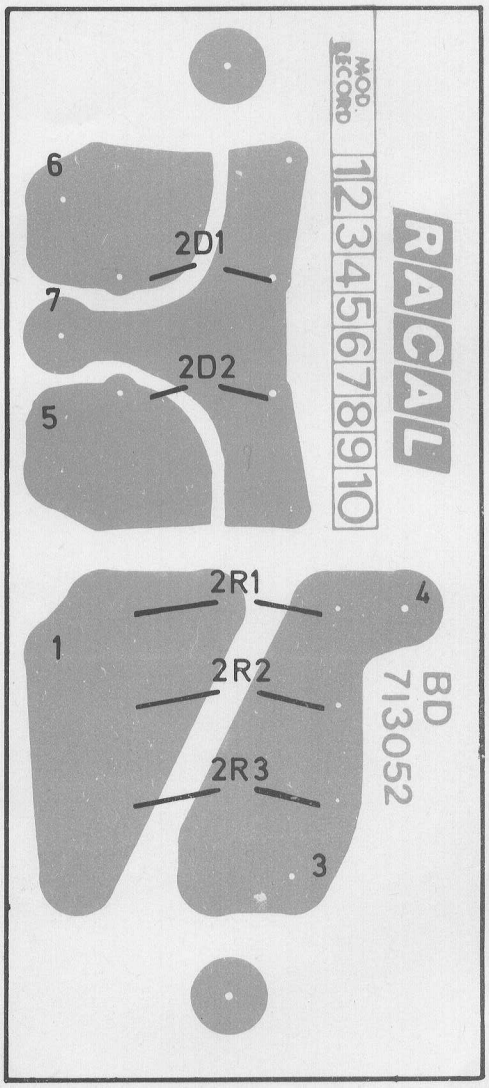


WOH 3059

WOH 3059

Component Layout: Regulator Board

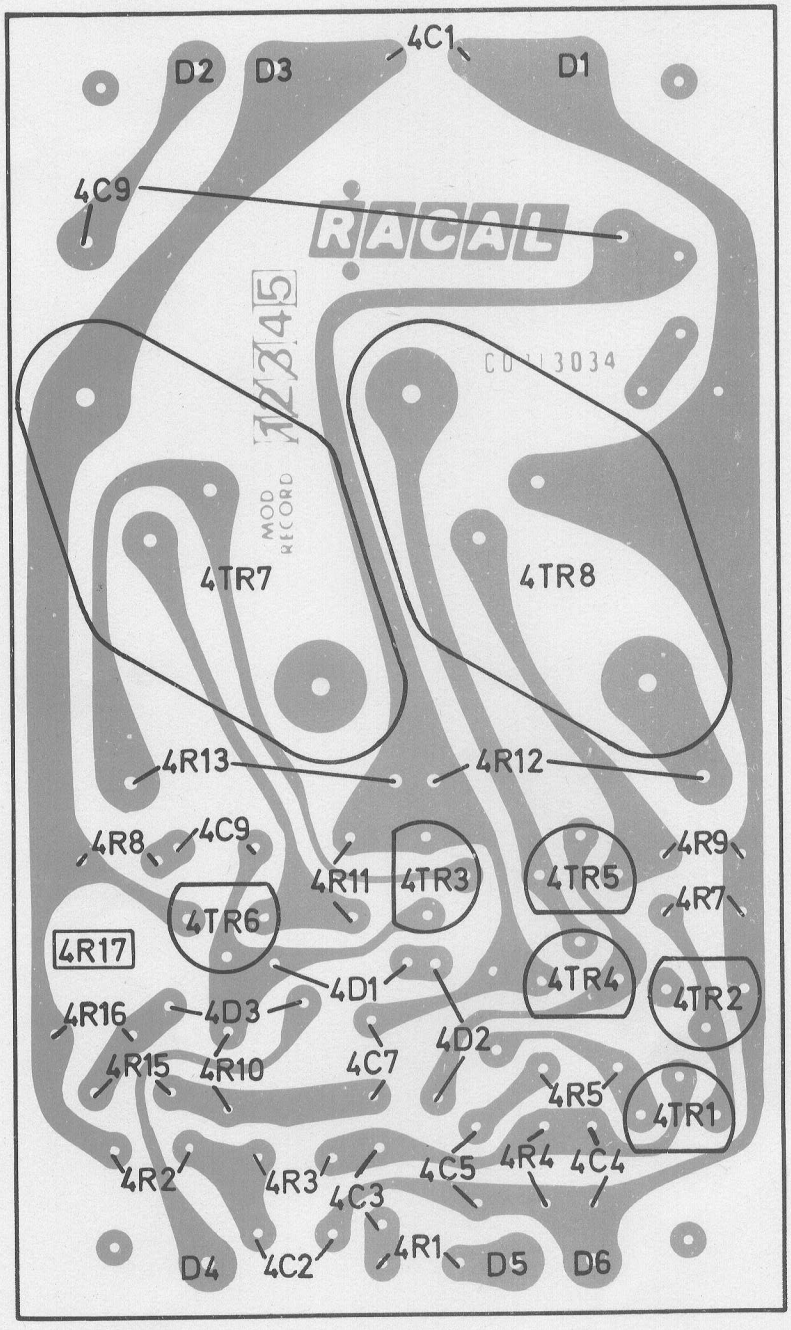
Fig. 4



Component Layout
Rectifier Board

WOH3059

Fig. 5

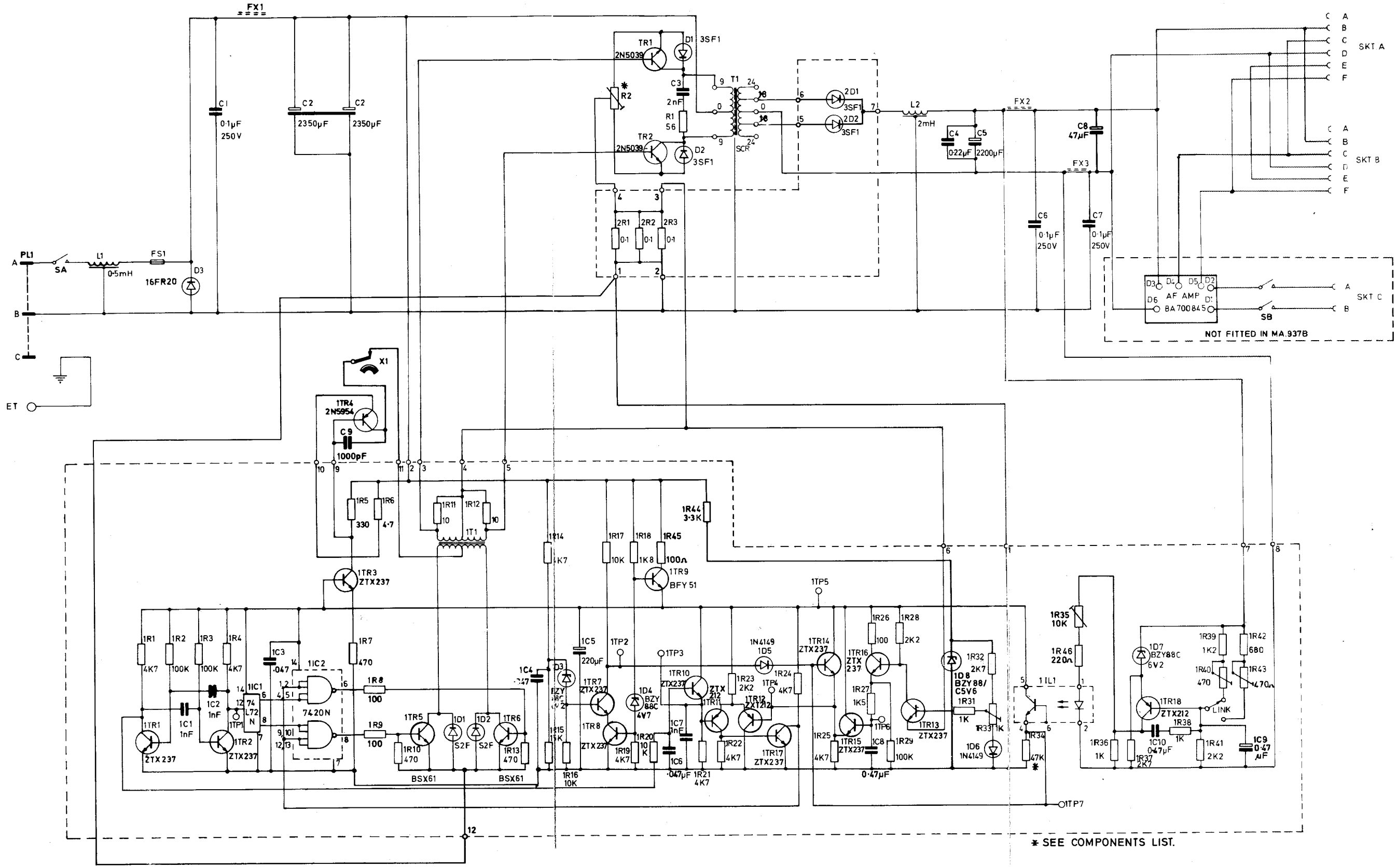


WOH3059	CD713034 SHT. 2
2 | 4	

WOH3059	CD713034 SHT. 3
3 | 4	

Component Layout:
Amplifier P.C.B

Fig. 6

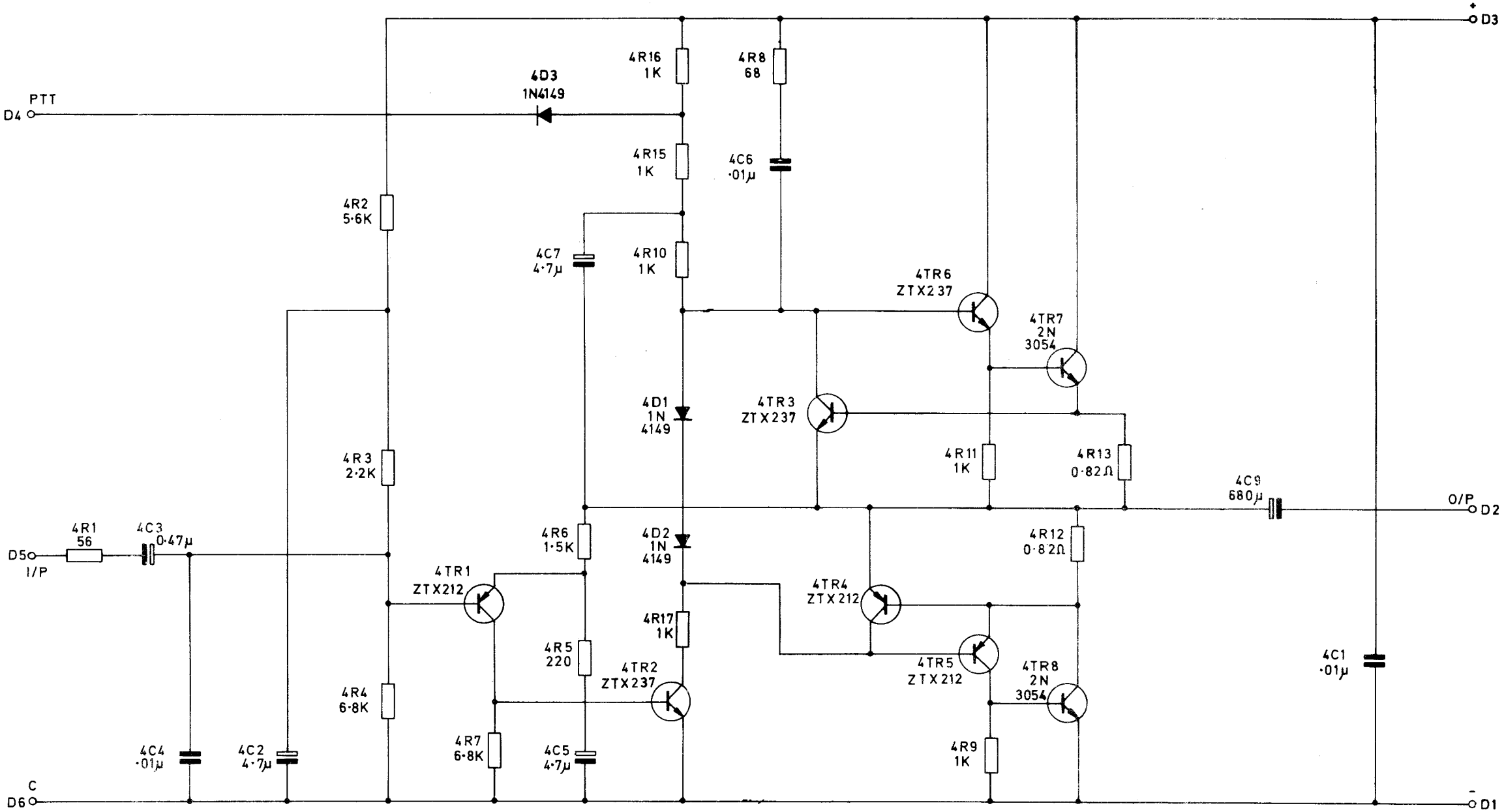


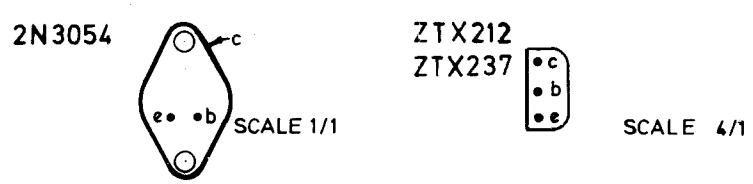
✱ SEE COMPONENTS LIST.

WOH3059	DC700882
4	5 8 9 10 11 13

Circuit Diagram: MA.937

Fig. 9



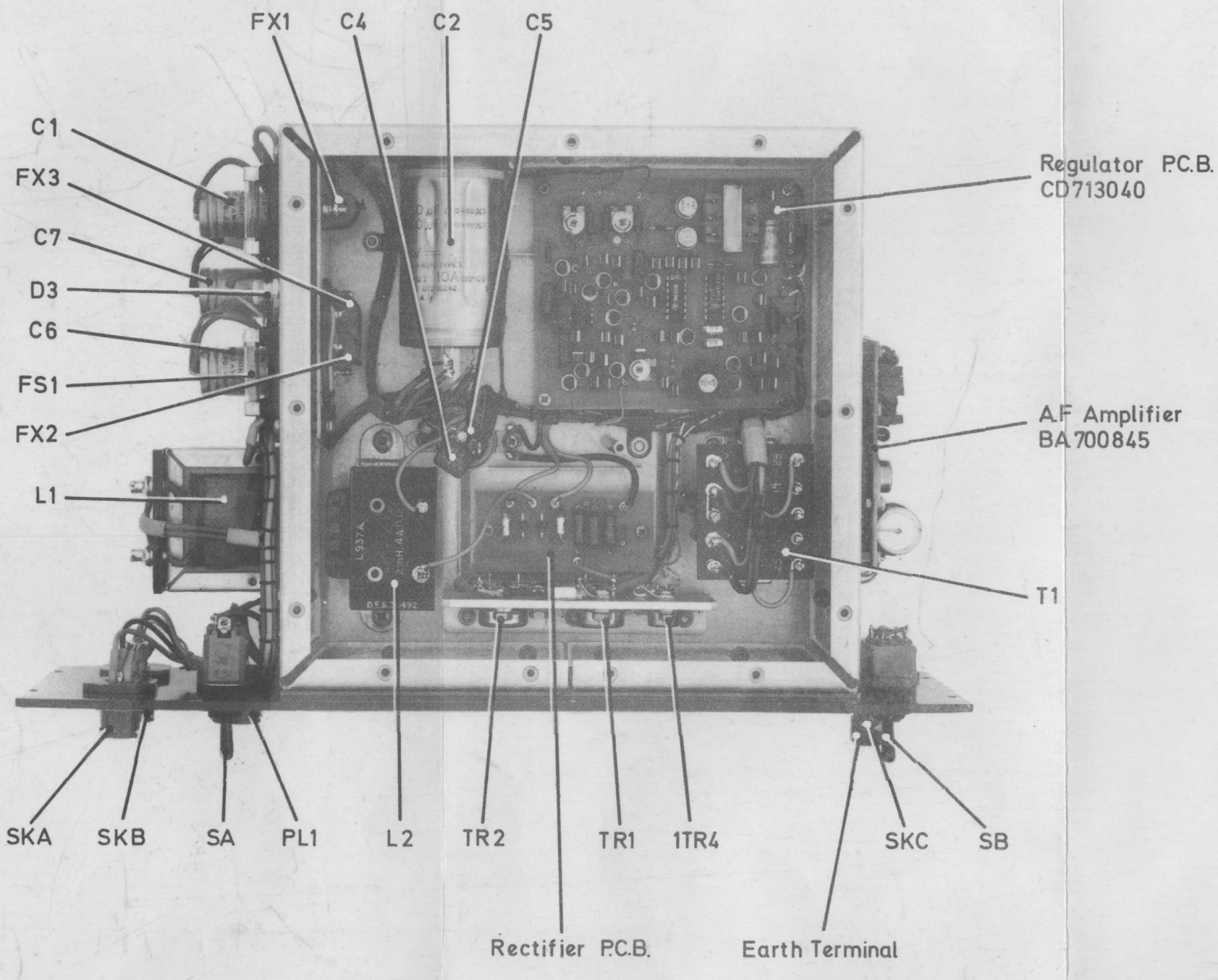


TRANSISTOR LEAD CONFIGURATION
(AS VIEWED FROM LEAD SIDE)

VOH3059	CC70064 5
4 5 6 7 8 10	

Circuit : Audio Amplifier

Fig. 8



WOH3059

Component Layout : MA.937

Fig. 7